

# *Republic of Kenya*

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KS 2110-5 (2009) (English): CCTV surveillance systems for use in security applications Part 5: Testing, commissioning and hand-over requirements (Draft Standard)



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**CCTV surveillance systems for use in security applications —  
Part 5: Testing, commissioning and hand-over requirements**

**PUBLIC REVIEW DRAFT, MARCH 2009**

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Associated Battery Manufacturers  
Kenya Railways Corporation  
Securicor Alarms (K) Ltd.  
Department of Defence  
Ministry of Roads and Public Works  
Kenya Power & Lighting Company Ltd.  
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**Foreword**

This Kenya Standard was developed by the Technical Committee on Extra-low Voltage and is in accordance with the procedures of the Bureau.

In the preparation of this Kenya Standard reference was made to SANS 10222-5-1-4:2003.

Acknowledgement is hereby made for assistance derived from this source.

PUBLIC REVIEW DRAFT

# CCTV surveillance systems for use in security applications — Part 5: Testing, commissioning and hand-over requirements

## 1 Scope

This standard gives recommendations for the testing, commissioning and hand-over of CCTV systems used in security applications.

The objectives of this part are to provide:

- a) Guidance to installers with respect to the testing and commissioning of CCTV systems;
- b) Guidance on how to compile a typical acceptance test procedure (ATP); and
- c) An overview of the commissioning and hand-over phases of the CCTV installation and completion of the system hand-over certificate.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. All standards are subject to revision and, since any reference to a standard is deemed to be a reference to the latest edition of that standard, parties to agreements based on this standard are encouraged to take steps to ensure the use of the most recent editions of the standards indicated below. Information on currently valid national and international standards can be obtained from Kenya Bureau of Standards.

KS 2110-1- *Installation and remote monitoring of detector activated CCTV systems- code of practice*

KS 2110-2 – *CCTV surveillance systems for use in security applications – Operational requirements.*

KS 2110-3– *CCTV surveillance systems for use in security applications – System design requirements.*

KS 2110-4– *CCTV surveillance systems for use in security applications –installation, planning and implementation requirements.*

KS 2110-6– *CCTV surveillance systems for use in security applications – Maintenance requirements.*

## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of this standard, the following definitions apply:

#### 3.1.1

##### **Back focus**

Distance between the external surface of the lens that is closest to the imaging device and the focal point

#### 3.1.2

##### **Camera housing**

Enclosure to provide physical or environmental protection (or both) for the camera, lens and ancillary equipment

#### 3.1.3

##### **CCTV camera**



Unit that contains an imaging device that produces a video signal from an optical image

#### 3.1.4

##### **CCTV camera equipment**

Unit that contains a CCTV camera plus appropriate lenses and the necessary ancillary equipment

#### 3.1.5

##### **CCTV control unit**

Equipment for controlling and monitoring the required operational functions of the CCTV system

#### 3.1.6

##### **CCTV surveillance installation**

Installation consisting of the hardware and software components of a CCTV system, fully installed and operational for monitoring a defined security zone

#### 3.1.7

##### **CCTV surveillance system**

System that consists of camera equipment, monitoring and associated equipment for transmission and controlling purposes, which could be necessary for the surveillance of a defined security zone

#### 3.1.8

##### **Character generator**

Device for generating alphanumeric characters or symbols (or both) and adding them into the image

#### 3.1.9

##### **Focal length ( $F$ )**

Property of a lens, expressed in millimetres, giving the angle of view for a given sensor size

#### 3.1.10

##### **Iris**

The imaging device of the CCTV camera

#### 3.1.11

##### **Lens**

Optical device for projecting an image of a desired scene onto the photosensitive surface of the imaging device

#### 3.1.12

##### **Operational requirement**

Statement of needs based on a thorough and systematic assessment of the problems to be solved and the hope for solutions

#### 3.1.13

##### **Pan-and-tilt camera unit**

Motorized unit permitting the vertical and horizontal positioning of the camera equipment

#### 3.1.14

##### **Picture storage**

Storing of video images

#### 3.1.15

##### **Preset shot**

Function in pan-and-tilt camera units or zoom lenses (or both) that allows automatic return to one or more predetermined positions

#### 3.1.16

##### **Time and date generator**

Device for generating the time and date and incorporating them into the image

**3.1.17****Time-lapse recording**

Periodical recording of video signals at predefined intervals

**3.1.18****Time multiplex recording**

Method for recording several video signals on one video channel by time multiplexing the frames of these video signals

**3.1.19****Variable focal length lens**

Lens with variable focal length in which the image does not remain in focus as the focal length changes

**3.1.20****Video matrix**

Unit for connecting several input video signals to several outputs

**3.1.21****Video monitor**

Device for converting video signals into pictures on a display screen

**3.1.22****Video motion detection**

Method of detecting movement in the view of the camera by electronic analysis of the change in picture contrast

**3.1.23****Video switcher**

Unit for switching a number of video input signals to one or more outputs manually or automatically or on receipt of an external signal

**3.1.24****Zoom lens**

Lens with adjustable focal length in which the image of the scene remains in focus as the focal length is changed

**3.2 Abbreviations**

For the purposes of this standard, the following abbreviations apply:

**3.2.1 ATP**

Acceptance test procedure

**3.2.2 CCIR**

Comité Consultatif International des Radiocommunication (International Radio Consultative Committee)

**3.2.3 CCTV**

Closed-circuit television

**3.2.4 PSDB**

The United Kingdom Police Scientific Development Branch

**3.2.5 PTZ**

Pan, tilt and zoom

**3.2.6 RPM**

Revolutions per minute

**3.2.7 VCR**

Video cassette recorder

**3.2.8 VMD**

Video motion detection

**4 Overview**



**4.1** Once an acceptable design specification has been produced, a system test specification shall be drawn up. The system test specification shall include tests that will be used to test the system for acceptance and tests to be carried out as part of a periodic test scheme. Care shall be taken to so select the tests that it shall be possible to ensure that the system fully satisfies its operational requirement. Points to be covered shall be agreed upon between the end-user (that is the person representing the customer or client) and the supplier. The level of visual performance testing shall include subjective testing, such as the visual assessment of the displayed picture quality, coverage of the surveyed areas and objective testing using an appropriate test target.

**4.2** The system test specification shall comprise procedures that include the following:

a) The visual and functional check of all parts of the CCTV installation. The visual tests cover the standard of workmanship of the installation, the functional quality of the various system components and their compliance with the system specification. The functional tests include checking the functional compatibility of the components of the installation;

NOTE The inspection tests may be carried out on individual parts of the installation as they are completed.

b) Confirmation that the operator manual and system documentation are complete;

c) The performance specification and results from performance testing, together with a signed inspection report;

d) Recommended maintenance schedule for the system if no maintenance contract has been agreed upon;

e) Sufficient training to ensure correct operation of the system if the functional requirement states that training is to be provided by the contractor; and

f) An acceptance document to establish the exact completion date.

**4.3** The focus of this standard is aimed at the larger, more complex, CCTV installations where clearly defined test procedures are necessary and a structured testing, commissioning and hand-over approach is evident. However, this does not mean that smaller systems do not need a similar approach. The only difference would be the scale of testing and documentation to be undertaken.

## 5 Testing

### 5.1 General

In order to ensure that all aspects of the system are thoroughly evaluated and tested, it is recommended that an acceptance test procedure (ATP) be documented beforehand. Key elements that should be included in the ATP are outlined in 5.2.

### 5.2 System specification

#### 5.2.1 Conformance

The ATP shall verify the conformance of all aspects of the system specification. A well-compiled specification shall include references to the aspects in 5.2.2 to 5.2.4.

#### 5.2.2 Measurable equipment specification

The minimum required performance criteria shall be included in the equipment specification. This normally includes measurable criteria such as bandwidth, resolution and signal to noise ratios. It is up to the end-user to decide whether published equipment specifications will be acceptable to verify the conformance of a product without proof in the form of test reports. In most instances, the cost of obtaining test reports from independent test laboratories to prove the conformance of a product is prohibitive (the majority of CCTV companies do not have the specialized equipment or the necessary skills to undertake this task). It is therefore advisable and strongly recommended that only products from well-known and reputable equipment manufacturers should be considered at the time of contract adjudication.

### 5.2.3 Operational equipment specification

The ATP shall also include a method of verifying, evaluating and proving the full operational aspects of the system.

### 5.2.4 Quality standards

The specification shall include the minimum accepted quality standard that applies to the installation. This may include standards such as:

a) ISO 9001: 2008 *Quality management systems – Requirements*

Equipment produced in a 9001 certified organization shall be preferred at the time of adjudicating a contract. Quality related procedures are instilled at all levels within such an organization, which allows for a proven quality consistency of the end products. In addition, the employment of an installation contractor certified to the same set of standards, who can also apply measurable quality standards to his work, documentation and all other aspects of the contract, shall also apply.

b) End-user quality standards

The ATP shall make provision to verify whether the installed system conforms to the user standards included in the system specification.

c) Published standards

In instances where it is required that a system shall be installed to conform to standards published by a standards authority such as Standards South Africa, then the ATP shall include a method of verifying such conformance of the installed system.

d) Installation standard

The ATP shall include a section devoted to this aspect of the installation. This is, typically, a visual inspection of the installed system.

## 5.3 Types of system tests

### 5.3.1 General

Various types of system tests can be used to evaluate the performance of the CCTV system to ensure that it meets its operational requirement. These tests might consist of some or all of the following:

a) Full test, testing all aspects of performance with regard to the total system;

b) Partial test, testing some or all aspects of performance of specific parts of the system; and

c) Spot checks, partial testing of the system, carried out at random or to some pre-determined pattern. This might be considered as "worst case scenario" testing. It is often used to confirm that previous tests have been carried out correctly. The spot check has the advantage of requiring minimum resources.

### 5.3.2 Detailed system tests

#### 5.3.2.1 General

The generic types of test listed in 5.3.1 shall be sub-divided into more detailed types of tests, as in 5.3.2.2 to 5.3.2.6.

#### 5.3.2.2 Feasibility testing

This test is carried out at the planning stage. Various options, including selection, placement and adjustment

of equipment, are tried out in order to see what can be achieved. The tests can be carried out at typical locations on a site "worst case scenario" or cover the whole site, i.e. at every proposed camera position.

#### 5.3.2.3 Setting-up testing

This test shall be carried out by the installer or contractor before the hand-over. It allows for final adjustments to be made to the equipment. It is an opportunity to ensure that the commissioning test will be merely a formality.

#### 5.3.2.4 Commissioning testing

This is a test of a system after it has been set up by the installer or contractor. It aims to demonstrate to the end-user, the effectiveness of the overall system in meeting the operational requirement. This test shall be as comprehensive as possible, as the results will be used to confirm end-user acceptance that the system is fit for operational use. Acceptance of the system will pass responsibility for any remedial action to the end-user.

#### 5.3.2.5 Coverage testing

A test target facing the camera shall be used for each area, at points within or near the area to be observed. The test target shall be positioned so as to ensure that the limits of the system are fully explored. This test target might be an individual, a physical object or a specifically designed CCTV test chart or model. The coverage test shall aim to:

- a) Confirm the area to be viewed in terms of coverage specified in the operational requirement;
- b) Confirm the size of the image of the target; and
- c) Show the existence and extent of all blind spots.

#### 5.3.2.6 Effectiveness of view test

The effective field of view from a camera is the useful view as displayed on the monitor. This might be reduced by blind spots caused by obstructions or areas that are poorly lit.

#### 5.3.2.7 Routine testing

The purpose of these tests is to ensure that the equipment is still functioning in accordance with the current operational requirement. It shall either confirm that no significant performance changes took place, or expose any shortfalls. It might include repetition of some or all of the commissioning tests, or a spot check based either on random selection or on some other means of determination.

### 5.4 Objective performance testing

**5.4.1** The usual methods of testing CCTV systems are very subjective and might vary from site to site. This lack of consistency and objectivity in performance testing might lead to some of the legal problems mentioned in the commissioning section. At the very least, it could cause confusion as to just what is an acceptable system. The most common causes of poor quality recordings are as follows:

- a) The subject is too small or not long enough in view;
- b) The images are out of focus or moving objects are blurred; and
- c) Cameras are not covering the relevant areas or the light was insufficient.

**5.4.2** Although many of the problems might be the result of poor system design and specification, the final commissioning testing does not always make them apparent. The absence of a simple but reliable accepted performance standard was identified as a key issue. This has led to the development of a device called the ROTAKIN (see figure 1).

**5.4.3** The ROTAKIN is a test target mounted on a stand. The target is a weatherproof panel measuring 1 600 mm x 400 mm, black in colour, and shaped at each end to represent the outline of a human head. It bears

high contrast resolution bars and a wedge chart for static and dynamic resolution measurements. A camouflage cloth cover allows additional intruder detection in various positions with or without the stand.

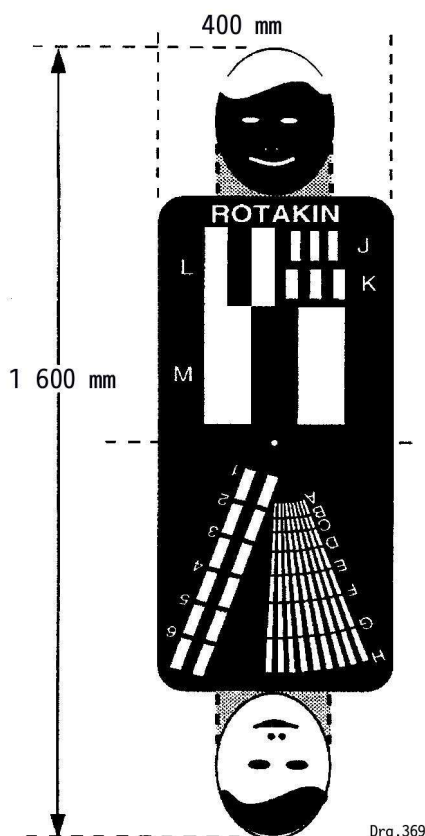
**5.4.4** A small battery driven motor shall rotate the target at 25 RPM. This is representative of a person moving quickly but stealthily. The complete kit is light and easily portable.

**5.4.5** The ROTAKIN test target shall be used to carry out the following objective tests:

- a) The area covered by each camera, to detect and eliminate blind spots;
- b) The size of the target and if it is readily seen;
- c) The system response time and staff reaction;
- d) The visibility of target camouflage against a contrasting background;
- e) The effects of different types of scene illumination; and
- f) Lens focus and adjustments.

**5.4.6** This type of objective performance testing is not generally a feature of the testing methods used by CCTV companies, as most companies only use subjective tests. Although the ROTAKIN test target is available in South Africa, it might be difficult to locate, as only larger CCTV companies have access to it.

**5.4.7** The ROTAKIN test target measurements and results shall form part of the acceptance test procedures. It also requires some skill to undertake the performance tests, recording of the results and the subsequent interpretation of such results. A knowledgeable CCTV contractor or supplier should be able to assist with this aspect.



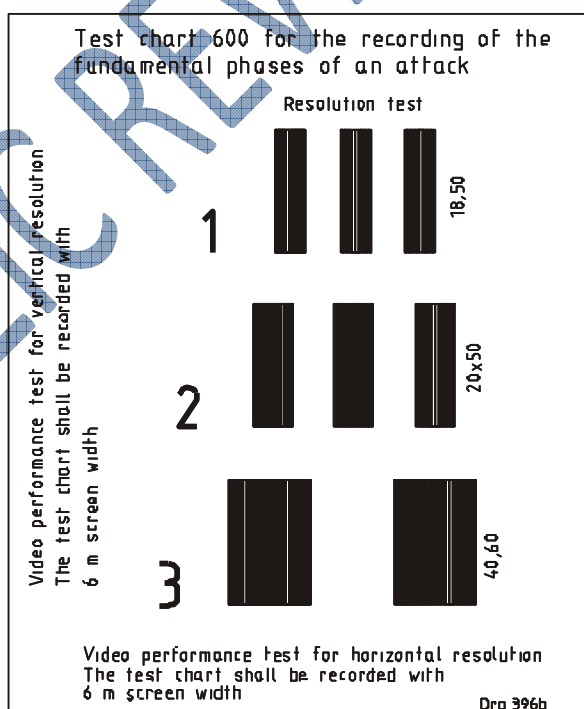
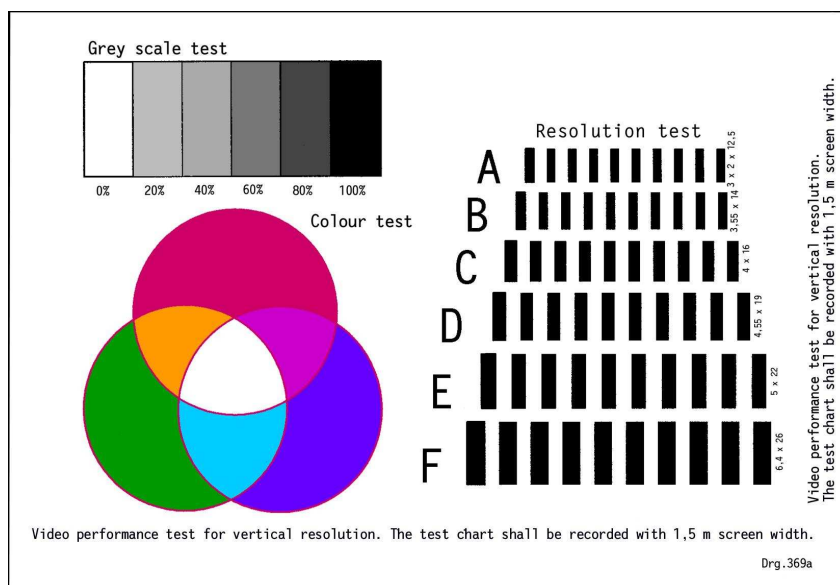
**Figure 1 — ROTAKIN test target**

**5.4.8** Due to increasing incidents of armed robbery in their banks, the German banking industry requested CCTV suppliers to develop some form of objective test measurement, in order to ensure that their CCTV systems meet the requirements of the police and justice departments in terms of quality evidential video

recordings. A committee consisting of representatives from the banking industry, security experts, the police, and the CCTV industry was formed. As a result of the committee's deliberations, two test charts were developed, the test chart 150 and the test chart 600.

These are shown in figures 2 and 3, respectively. These charts provide video performance test patterns for horizontal and vertical resolution, colour rendition and grey scale compare

**Figure 2 — Test charts 150**



**Figure 3 — Test charts 600**

**5.4.9** The size of an object (target) on a CCTV monitor screen shall be appropriate to the task of the operator, for example, identification, recognition, detection or monitoring. If the target is a person, the usual method to determine the above parameters is the height of the target in relation to the monitor screen. For

this method, the minimum sizes (see SANS 10222-5-2) shall be as follows:

- a) For identification, the target shall represent at least 120 % of the screen height;
- b) For recognition, the target shall represent at least 50 % of the screen height;
- c) For detection, the target shall represent at least 10 % of the screen height;
- d) For monitoring and control purposes, the target need only represent 5 % of the screen height.

The ROTAKIN test figure uses the height of the target as the basis for determining whether or not the needs of the operator have been met.

**5.4.10** The German test targets, however (which were developed for internal use), use the width of the scene as the reference point. For identification purposes the width of the test scene is deemed to be 1.5 m, i.e. the operator or other responsible authority shall be able to identify the person in the scene from the video recording. For recognition purposes, the scene width is deemed to be 6.0 m, i.e. it shall be possible to recognize the person but, more importantly, the movements (or activity) of the person (or persons) in the scene from the video recording. The 150 and 600 test charts represent these requirements respectively. From a banking aspect, cameras shall be positioned to capture clear, identifiable images of individual perpetrators and, in addition, capture essential parts of the actual hold up or robbery, including the faces of the perpetrators.

**5.4.11** During the installation, each camera shall be tested by recording the person in the test scene holding the test chart at waist height, using one or other of the test charts, depending on the operational requirement. It is essential to ensure that the tests meet the scene width requirements by using a tape measure or some other measuring means to accurately determine the scene width. In addition, the person holding the test chart shall also stand in a similar position to that in which the likely target would stand.

**5.4.12** When testing the identification capability of a particular camera, it shall be possible to clearly distinguish resolution test line "C" on the video recording, when the person holding test chart 150 is standing within a scene width of 1,5 m. For example, for a 1/3" camera with a lens that has a focal length of 8 mm, the distance from the person holding the test chart will be approximately 2.5 m. (See table 1.)

**5.4.13** When testing general view (or recognition) requirements of a camera, a similar procedure shall be used, with the exception that the scene width shall be 6 m and test chart 600 shall be used. For the image to be acceptable, resolution test line "2" shall be clearly distinguished on the relevant video recording. For example, for a 1/2" camera fitted with a lens of focal length 6 mm, the distance to the object will be approximately 5.6 m. (See table 1.)

**5.4.14** Test chart 150 shall also be used to provide qualitative judgement of the colour rendition of colour cameras as well as grey scale comparison for monochrome cameras. The greater the number of distinguishable shades of grey that a camera can produce, the more realistic a picture shall be produced.

**5.4.15** The distance to the object (or target) for scene widths of 1,5 m and 6,0 m respectively, shall be calculated for different sizes of sensor formats and different lens focal lengths. Because of manufacturing tolerances, the actual distance can vary slightly. The width and height of the different CCD sensor formats are given below

- Sensor format 2/3". 8,8 mm x 6,6 mm (width x height)
- Sensor format 1/2". 6,4 mm x 4,8 mm
- Sensor format 1/3". 4,8 mm x 3,6 mm
- Sensor format 1/4". 3,6 mm x 2,7 mm

**5.4.16** The formula for calculating the distance to the object shall be as follows:



$$\text{Object distance.} = \frac{\text{Lens focal length} \times \text{Scene width}}{\text{Width of CCD sensor}}$$

A similar formula can be constructed for the height of a scene and the corresponding height of the sensor, namely:

$$\text{Object distance.} = \frac{\text{Lens focal length} \times \text{Scene Height}}{\text{Height of CCD sensor}}$$

By transposing the formula,

$$\text{Lens focal length.} = \frac{\text{Object distance} \times \text{Width of sensor}}{\text{Scene width}}$$

**5.4.17** Table 1 provides worked examples for different sensor formats, lens focal lengths and scene widths based on test charts 150 and 600.

**Table 1 — Object distances with respect to  
Lens focal lengths and sensor formats**

1	2	3	4	5	6	7	8	9	10	11	12	13
Sensor format	Scene width	Test chart	Object distance ( in m) with respect to lens focal length ( in mm)									
			25	16	12	8	7.5	6	4.8	3.5	2.8	2.1
2/3"	1.5m	150	4.2	2.7	2.0	1.4	1.3	1.0	0.8	0.6	0.5	0.4
2/3"	6.0m	600	17.0	11.0	8.2	5.4	5.1	4.1	3.3	2.4	1.9	1.4
1/2"	1.5m	150	5.9	3.8	2.8	1.9	1.8	1.4	1.1	0.8	0.7	0.5
1/2"	6.0m	600	23.4	15.0	11.3	7.5	7.0	5.6	4.5	3.3	2.7	2.0
1/3"	1.5m	150	7.8	5.0	4.7	2.5	2.3	1.9	1.5	1.1	0.9	0.7
1/3"	6.0m	600	31.3	20.0	15.0	10.0	9.4	7.5	6.0	4.4	3.5	2.6
1/4"	1.5m	150	10.4	6.7	5.0	3.3	3.1	2.5	2.0	1.5	1.2	0.9
1/4"	6.0m	600	41.7	26.7	20.0	13.3	12.5	10.0	8.0	5.8	4.7	3.5

**5.4.18** Other additional information that might be useful when testing a CCTV installation is that of the horizontal angle of view provided by different lens focal lengths and sensor formats. The horizontal angle of view is the maximum horizontal scene angle that can be seen through the lens. Similarly, the vertical angle of view is the maximum vertical angle that can be seen through the lens. The most common angle of view used during testing is the horizontal one. Table 2 provides typical values for different lens focal lengths and sensor formats.

**Table 2 — Horizontal angle of view with respect to lens focal lengths and sensor formats**

1	2	3	4	5	6	7	8	9	10	11
Sensor format	Horizontal angle of view ( in ° ) with respect to lens focal length ( in mm )									
	25	16	12	8	7.5	6	4.8	3.5	2.8	2.1
2/3"	20	30.8	40.3	57.6	60.8	72.5	84.9	103.0	115.1	129.0
1/2"	14.6	22.6	29.9	43.6	46.2	56.1	67.4	84.9	97.6	113.5
1/3"	11	17.1	22.6	33.4	35.5	43.6	53.1	68.9	87.6	97.6
1/4"	8.2	12.8	17.1	25.4	27.0	33.3	41.1	54.4	65.5	81.2

**5.4.19** As with the ROTAKIN test target, the German test charts 150 and 600 are usually not used as part of the testing, commissioning and hand-over process – although the charts are available in South Africa from previously stated CCTV distributors or installers (or both), reliance on only subjective type testing might sometimes lead to a dispute between the end-user and the CCTV installation company as to what constitutes an acceptable system or, at the very least, parts of the system. This disagreement normally relates to specific views (images seen at the monitor) of individual cameras, either in the live mode or the video recording playback mode.

**5.4.20** Some form of objective testing shall be included in the acceptance test procedure (ATP), using the test targets described, or any other appropriate objective test means (this is to be agreed between the end-user and the CCTV installing company). For example, the British Police Scientific Development Branch (PSDB) has designed a range of test targets. Two are very similar to the German test charts 150 and 600. One was developed to provide a reference for grey scale, colour, facial appearance and image detail and another very simple resolution test chart.

**5.4.21** The ROTAKIN test charts 150 and 600 as well as those designed by the PSDB are all approved by Standards South Africa for use in testing CCTV systems.

## **5.5 Typical equipment testing**

### **5.5.1 General**

Guidelines for the testing of typical equipment found in a CCTV system are detailed in 5.5.2 to 5.5.9.

### **5.5.2 Camera video images**

This is a visual test, and it shall be performed as follows:

- a) Monitors used during the test shall retain the same brightness and contrast settings for all cameras; and
- b) Colour cameras shall be displayed and inspected on a colour monitor, and monochrome cameras shall be displayed and inspected on a monochrome monitor. This allows a true reflection of the camera performance and settings.

### **5.5.3 Individual camera tests**

The recommended tests are:

#### **a) Camera lenses**

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Check that the correct lenses are fitted in line with the specification and that the focus and back focus of the cameras are adjusted correctly.

**b) Camera angle of view**

The test procedure shall clearly state the required coverage of each of the cameras. The camera coverage shall be inspected closely to confirm if the area is covered in accordance with the requirement. Camera viewing angles shall be adjusted on the spot by the installation staff, during the test.

**c) Daytime performance of the camera**

These tests include checking the camera lens focus and iris settings. A test procedure for zoom lens focus tracking shall be included. This test shall confirm whether the back focus settings of the cameras are done correctly (i.e. camera image remaining in focus when zooming out).

**d) Night time performance of the cameras**

Any CCTV system that is used for day and night surveillance shall also be tested at night. These tests shall include the camera lens focus and iris settings. Lens adjustments shall be done at night as this represents the worst case scenario, i.e. the lens iris shall be open, and shall result in a shorter lens depth of field requiring an accurate focus adjustment.

**e) Video text**

During these tests, any camera text that may be superimposed on the video image shall be verified in accordance with tabulated camera descriptions. The action of switching camera images to each monitor shall confirm the operation of installed video matrix switching facilities. Each of the cameras shall be selected for viewing on each of the monitors.

#### **5.5.4 Video recordings**

Perform the following important checks and tests:

- a) Ensure that appropriate storage facilities are provided to archive recorded videotapes;
- b) Review video recordings to test the system performance;
- c) If more than one VCR is installed, ensure that they all display the same correct time and date;
- d) Load the VCRs with the supplied tapes and activate to record. Verify automated alarm-activated recordings; and
- e) Verify time lapse speed settings of time-lapse recorders in accordance with the specified requirements.

#### **5.5.5 Video switchers**

Check that the dwell time and sequencing of video signals are as specified. If there are multiple video connections, ensure that the correct termination is applied.

#### **5.5.6 Video multiplexers**

Check that the time, date and camera titles are set correctly. Also check that multiplexers are programmed to match the speed of the VCR in use.

#### **5.5.7 Video motion detection**

Check that the system operates under the worst lighting conditions if external surveillance is required. Irrespective of whether or not the system is used internally or externally, check that the VMD feature does not cause false alarms and is sensitive enough to detect movement.

### 5.5.8 PTZ units

Test PTZ units to ensure that the fixing bolts are tight, that there is no sign of water seepage into fittings, plugs or sockets and that the end stops are correct and not loose. Check that the pan/tilt controls correspond to the correct direction of movement. If, for example, the operator requires the unit to pan left by moving the control mechanism to the left, ensure that the actual unit moves to the left, etc. Reversing of the cable terminations such that an operator control movement left results in the PTZ unit moving right is quite common. If PTZ unit pre-set positions are incorporated as part of the system, check that the specific fields of view are covered.

### 5.5.9 Other tests

The ATP shall include a test procedure for all other installed system components, such as graphic user interfaces (GUI) and alarm systems such as camera signal fail units. A functional test for each facility of the installed components shall be included.

## 5.6 Documentation of the tests

**5.6.1** Tabulate the required tests in a spreadsheet format and include columns for recording the results and remarks of each test performed. Specify the required corrective action for rejected items. It is advisable that the contractor has sufficient skilled personnel on site, during the tests, to adjust cameras, address minor problems, etc. during the test.

5.6.2 and 5.6.3 below contain general information relating to CCTV systems for consideration when writing an ATP.

### 5.6.2 Conformance with the specification

It is important to determine which of the clauses of a specification need to be tested for conformance before documenting the test procedure. Each of the clauses of a specification shall therefore be categorized as shown in the example below.

**Typical ATP conformance to specification documentation format**

1	2	3	4	5	6	7
Clause	Statement	Demonstrate	Test	Visual	Not applicable	Specification reference

a) **Clause:** This is the specification reference or paragraph number.

b) **Statement:** Many statements are made in a tender specification. In such a case the ATP must indicate that this is a statement only and not subject to testing.

c) **Demonstrate:** The requirement specified in the clause shall be proven by a demonstration test to the nominated representative of the end-user and a procedure shall be documented for each demonstration to be performed. These tests shall prove conformance to "Operational equipment specification" as noted under 5.2.2.

d) **Test:** Conformance to the specification shall be tested and a test procedure shall be documented for each of the tests to be performed.

e) **Visual:** Conformance to the specification is visually inspected.

f) **Not applicable:** Such a clause is not applicable to testing, such as a change in the specification after the initial publication.

g) **Specification reference:** Such a clause shall include reference of conformance to a published specification or the equipment brochure as noted under 5.2.2.

### 5.6.3 Documenting the tests

The recommended format for documenting the test results in the ATP is as follows:

**Typical ATP test result documentation format**

1	2	3	4	5	6
Item	Reference	Description	Accepted	Rejected	Remarks

The definition of each item tabulated above is as follows:

a) **Item:** This is an incrementing reference number starting at number one.

b) **Reference:** The test reference number refers to each of the written test procedures for the items categorized as "Demonstrate" and "Test" in 5.6.2.

c) **Description:** The description of the test is tabulated here.

d) **Accepted:** The nominated representative of the end-user shall initial this column, should an item pass a test. The **remarks** column shall be completed to include additional information for future reference.

e) **Rejected:** The nominated representative of the end-user shall initial this column should an item fail a test. The **remarks** column shall be completed to indicate the required corrective action for the item to pass the test.

### 5.7 Performance test failures

Reasons for performance test failures shall, where possible, be noted during the test. The following are typical examples:

#### a) System design

- Target too small
- Target concealed from view
- Area not covered by cameras
- Equipment too slow
- Equipment difficult to operate
- Equipment malfunction
- Excessive alarm rate
- Search task too complex
- Inadequate viewing conditions

- Light glaring on the monitor screen
- images not focused
- focus error due to lack of depth of field
- movement blur

b) **Lighting**

- Blinding the camera
- Shadows concealing the target
- Insufficient contrast between the target and background

## **6 Commissioning**

### **6.1 General**

**6.1.1** Once all the components in an installation have been tested, checked and set up, the system shall be commissioned to function as specified in the specification documents. This really means operating the system from the controls and ensuring that every function and view is as originally designed. Normally, it might be necessary to make some fine adjustments to the cameras, lenses and angles of view, etc. At this stage, a record of every camera and the scene in view, shall be made. It is also advisable to comment on the details that can be seen at various distances from the camera.

**6.1.2** Commissioning might often require operating the system through the night, if appropriate. Particular note shall be made of the views and focus of cameras using artificial or infrared illumination (or both). There might be areas of flare or dark pockets that have to be considered. It is not always easy to predict what the effect of artificial or infrared illumination might be during the design stage. Therefore, during the commissioning stage, reducing or increasing the power of some of the lamps (or even repositioning of lamps) shall be considered if they are not producing the expected results.

**6.1.3** It is recommended that an experienced person undertake this commissioning process.

**6.1.4** Apart from the obvious testing and checking of the overall CCTV system, other issues shall be addressed during the commissioning stage. These include:

- a) The completion of the operator's manual, the maintenance manuals and other documentation in respect of the system;
- b) The completion of a signed inspection report on the performance specification and results from performance testing;
- c) The availability of a recommended maintenance schedule for the system, if no maintenance contract has been agreed on;
- d) Sufficient training to ensure correct operation of the system takes place, especially if the operational requirement states that training is to be provided, by the contractor, on the operation of the system; and
- e) An acceptance document drawn up to establish the exact completion date of the system.

**6.1.5** An important aspect of commissioning the system shall be to record all programming and equipment set-up procedures that have been carried out. These have to be included in the final operation and maintenance manuals that will be handed over on completion. There might be such items as the programming of multiplexers, the programming of alarm handling, sequences set up on matrix switching systems, etc. These shall be fully documented in the operation and maintenance manuals.



## 6.2 Operation and maintenance manuals

**6.2.1** Documentation is possibly the most common problem found in all CCTV installations. It is normally poor in quality or non-existent. Irrespective of the type of information required, the principle of concise, complete and unambiguous information shall apply.

**6.2.2** Three copies of the final operating and maintenance manuals for the system should be supplied. The manuals shall be bound in book form with hard plastic covers to withstand constant use.

**6.2.3** The manuals shall be properly indexed to facilitate easy reference.

**6.2.4** The manuals shall include the following information:

- a) A list of spares to be supplied by the contractor (installer) to cover the period of maintenance. This list shall cover all spares to be held in stock by the contractor for the CCTV installation and shall not in any way relieve the contractor of the obligation to provide spares required during the maintenance period;
- b) A list giving the name and address of the local agent for each item of equipment;
- c) A list giving the name and address of the manufacturer of each item of equipment;
- d) A copy of all test certificates received with the system;
- e) A preventative maintenance programme for all equipment;
- f) Operating instructions for each item of equipment;
- g) Complete as built drawings of the installation and wiring and schematic diagrams;
- h) Detailed operating instructions for all the modes of operation of the system;
- i) Acceptance document; and
- j) Test and commissioning data sheets.

**6.2.5** The aim of the contractor shall be to provide the end-user with sufficient information to be able to have the system maintained by any competent company in the future. The need to produce this documentation shall be considered in the price quoted for the system in the first place. Produced effectively, the documentation could represent a significant cost that should not be ignored.

## 7 System hand-over

### 7.1 General

**7.1.1** Once the person responsible for commissioning is satisfied that the system meets the system specification, it has to be formally handed over to the end-user. For large CCTV systems, this could be the culmination of months of discussions and negotiations that are as vital as the original specification. It is the opportunity for the end-user to comment on the installed system. This shall also form a legal foundation for the installation company. A responsible representative of the end-user shall be present during the entire hand-over proceedings. It shall be established that this person has the authority to sign for the installation on behalf of the end-user.

**7.1.2** The starting point of the hand-over process shall be to go through the specification in detail. The aims and objectives of the system shall be clearly understood by everyone attending. If there is a video recorder in the system, it is advisable to record the hand-over proceedings. In this regard each camera position shall be recorded in the three-hour mode for at least 10 s.

**7.1.3** The next phase is to operate the system and obtain agreement on every camera view. It is in this area that there is the most likelihood of misunderstanding. Until this point, the end-user has probably only seen the theoretical areas of view on drawings and described in the specification.

Things like perspective and size of people and objects can suddenly seem different from that perceived during discussions. At this stage the importance of a detailed and descriptive specification is significant.

**7.1.4** Instead of spending much time on debating one scene, it is preferable to make notes and carry on viewing all the other cameras. In the eyes of the end-user this might develop a better understanding of the whole system and how it functions. Provided the system has been properly designed, it shall also put into perspective the appropriateness of each scene in contributing to the whole project.

**7.1.5** If, in the end, there are still problems or disagreements on the camera scene, then a further discussion shall be necessary. It will frequently be the situation where compromise has to be made in the selection of lenses, for instance, there is no lens available between a 25 mm and a 50 mm lens. Usually an explanation of the compromise satisfies the end-user. At times, there might be a mistake in the selection of a lens. In this case, the contractor shall have no hesitation in agreeing to change it. The action shall be to make notes of comments from the end-user but continue with the hand-over procedure with a view to returning to the comments.

**7.1.6** The hand-over shall proceed with a demonstration of every function and feature of the system. If there are multiplexing and video recordings, recording shall be made at all time lapse modes to be used. This shall be played back to the end-user as part of the hand-over process. Similarly, "electronic zoom" on a multiplexer shall be demonstrated and the limitations as well as its use shall be explained. If there are alarm inputs to a multiplexer or matrix, they should be activated and the results demonstrated. If there is any type of motion detection system, it shall be thoroughly "walk tested".

**7.1.7** If the system is to be operated during the night time, the hand-over procedure shall include it, with "walk testing" motion detection equipment if necessary.

**7.1.8** At the end of the hand-over procedure there might be a snag or exception list agreed between the contractor and the end-user. This should only be a list of minor corrections or adjustments to be made, for example, the changing of one or more lenses. The contractor shall now obtain the end-user's signature on a standard form (see annex A for a typical hand-over certificate, including a section for remarks and exceptions), accepting the installation subject to an agreed list of work to be done, if relevant. This shall state a time scale within which the work will be completed. It is quite unreasonable for an end-user to refuse to sign such a document, provided that the list consists of only minor faults.

**7.1.9** Speed in carrying out any outstanding work is very important. It shall be completed within the time scale agreed upon (see 7.1.8). Delays at this stage can cause a total disproportionate amount of aggravation and lose a great deal of goodwill. When all the outstanding items are complete, a final completion certificate and a final acceptance obtained from the end-user shall be issued. The last thing to do is to handover the finalized version of the operation and maintenance manuals.

## **7.2 Problems in completing**

**7.2.1** If the guidelines outlined in the associated standards have been followed, there should be no reason why the end-user should not sign off the system and authorize payment. However, there might be many reasons for an end-user refusing to pay.

**7.2.2** Before any action is taken, an objective and thorough internal investigation shall be carried out to find the cause of discontent. The objective is not to find a scapegoat but to establish what needs to be done. This is the other aspect where speed is essential.

**7.2.3** Immediate communication with the end-user is equally important to advise that the matter is being looked into. This might prevent unpleasant legal implications later. It is, however, sensible to avoid the delay by maintaining accurate documentation. If no legitimate reason can be found for refusal to accept the system, then the next move shall be made.

**7.2.4** An approach at the most senior management of the end-user level shall be made by the most senior manager in the installing company. At this stage it shall be assumed that courtesy might achieve more than threats, for example, it might be that the end-user is short of cash and that a mutual arrangement can be made.

**7.2.5** If the approach in 7.2.4 fails, it is possible that the end-user has no intention of paying. This usually involves creating a smoke screen of fatuous complaints and unfounded criticisms of the system. Again, speed is of the essence and there are two actions to consider:

a) The first is to put the matter in the hands of the contractor=s solicitors with an instruction to implement legal action; and

b) The second shall be to employ an independent consultant who is knowledgeable about the type of installation. The brief shall be to make a completely independent and objective assessment of the CCTV installation. If the contractor is totally blameless, it gives confidence to proceed with legal action. Often this action alone might spur the end-user into paying.

**7.2.6** It could, however, be that the contractor is partially to blame, in which case it is better to know it sooner rather than later. The consultant's report shall have included recommendations on how to rectify the situation. Therefore, these shall be carried out as quickly as possible.

**7.2.7** If the operational requirement is clearly defined, the survey carried out efficiently, the specification carefully prepared and the installation professionally carried out, the probability of the end-user failing to pay will be remote.

## **8 Training**

### **8.1 General**

Another important aspect of the commissioning and hand-over process is the training of operating staff and, to a lesser extent, the end-user=s maintenance staff. The details of training provided shall have been given in the specification. The training shall include an understanding of all the functions in the system as well as the operation. A good starting point shall be the aims and objectives of the system as stated in the specification. The specification shall then form a large part of the training program. There are no fixed rules for training, because every installation is different. Even so, no matter how small the system is, someone shall be trained to operate it. The ATP shall make provision for acceptance of the specified training requirement. The training aspects in 8.2 to 8.5 shall be considered.

### **8.2 Operator training**

The installing company shall provide this training by using the operation and maintenance manuals described in 6.2. The complexity of the installed system might require that follow-up training be provided once the user is familiar with the system operation. This aspect shall also be addressed in the ATP.

### **8.3 First-line maintenance**

In cases where the end-user has technicians on site to provide first-line maintenance, the contractor shall provide such training. The technical manual shall include a fault-finding flow chart to assist the technicians in localizing a fault to a modular level.

### **8.4 Second-line maintenance**

In cases where the end-user has skilled technicians on site to provide second-line maintenance to component level, the supplier shall provide such training.

### **8.5 Factory training**

It might be necessary to include a requirement that the end-user's technicians receive training at the premises of the manufacturer. In certain cases this might include an overseas trip, which, due to the costs, might not be possible.

**Annex A**  
(Informative)

**Hand-over certificate**

Contract/order No \_\_\_\_\_

Contact description: \_\_\_\_\_

Name of contractor/installer: \_\_\_\_\_

Contract completion date: \_\_\_\_\_

Hand-over date: \_\_\_\_\_

As-built drawings included	Yes / No	(please tick as appropriate)
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Manuals/documentation provided	Yes / No	(please tick as appropriate)
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Training received	Yes / No	(please tick as appropriate)
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**Remarks and exceptions**

NOTE This section will include any relevant information or components regarding the outstanding items (i.e., the exceptions to the original contract work) to be completed and the agreed period of time for such completion. If this list is lengthy, it should be referred to in this section and a separate exception list attached to the hand-over certificate.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Signed by:**

**Contractor/installer:**

**End-users representative:**

**Signature:**

\_\_\_\_\_

\_\_\_\_\_

**Name:**

\_\_\_\_\_

\_\_\_\_\_

**Date:**

\_\_\_\_\_

\_\_\_\_\_